


PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 47225+A		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/IT 03/00631	International filing date (day/month/year) 15.10.2003	Priority date (day/month/year) 18.10.2002	
International Patent Classification (IPC) or both national classification and IPC B26D7/12			
Applicant FABIO PERINI S.P.A. et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 7 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input checked="" type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>			
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Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer Gelder, K Telephone No. +49 89 2399-2035	



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/IT 03/00631**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-15 as originally filed

Claims, Numbers

1-48 received on 02.10.2004 with letter of 02.10.2004

Drawings, Sheets

1/10-10/10 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees, the applicant has:

- ☐ restricted the claims.
☐ paid additional fees.
☐ paid additional fees under protest.
☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
☐ not complied with for the following reasons:

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-48
	No: Claims	
Inventive step (IS)	Yes: Claims	1-34
	No: Claims	35-48
Industrial applicability (IA)	Yes: Claims	1-48
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item IV

Lack of unity of invention

The separate inventions are:

1. Claims: 1 - 34

Device and method for sharpening a disk-shaped cutting blade having a bevelled continuous circular cutting edge, by use of a first and a second grinding wheels acting on first and second side of said bevel, wherein the first grinding wheel has a finer grain size than said second grinding wheel, and the inclination of said first grinding wheel is slightly greater than the inclination of the first side of the bevel, while the inclination of the second grinding wheel is substantially parallel to the second side of the bevel.

2. Claims: 35 - 48

Disk-shaped blade to cut rolls of wound web material having a bevelled continuous cutting edge, whereby at least said first side having a NITREG™ surface hardening treatment with a thickness of at least 30 micrometers.

As independent claim 1 defines a sharpening unit per se with the blade not being part of the sharpening unit, this claim has nothing in common with claim 35, which defines a circular cutting blade per se.

The common concept linking together the independent claims 9, 24 and 35 is the following: a bevelled continuous cutting edge, whereby the first side of said bevel has a greater radial extension than said second side, and at least said first having a surface hardening treatment. This common concept is not novel, as also acknowledged by the applicant, see document WO 00/21722 A1).

The potential special technical feature of claim 35, i.e. the thickness of a NITREG™ surface hardening treatment of at least 30 micrometers cannot be regarded as "corresponding" to any of the potential special technical features of claim 9 or 24 ("grain size", "inclination").

The requisite unity of invention (Rule 13.1 PCT) therefore no longer exists inasmuch as

a technical relationship involving one or more of the same or corresponding special technical features in any of the independent claims, in the sense of Rule 13.2 PCT, does not exist between the subject-matter of the aforementioned groups of claims.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

I. Claims 1 to 34

(i) Reference is made to the following documents:

D1: US Re. 30598

D2: WO 00/21722 A1

D4: US2001/0009122 A1

D5: EP 1 229 143 A2

(ii) The subject-matter of claims 1, 9 and 24 is new within the meaning of Article 33(2) PCT, since none of the available documents discloses a sharpening unit, cutting machine or blade sharpening method having a first grinding wheel adapted to act on a first side of the bevel of the blade to be sharpened, with a finer grain than a second grinding wheel adapted to act on a second side of the bevel.

(iii) The document D2 is regarded as being the closest prior art to the subject-matter of claims 1, 9 and 24 and discloses a sharpening unit, a cutting machine and blade sharpening method in accordance with the pre-characterising portions, respectively.

The concept underlying the distinguishing characterising features of claims 1, 9 and 24, respectively, is the combination of

- (a)** the first grinding wheel having a finer grain than the second grinding wheel, and
- (b)** the arrangement of the grinding wheels such that the inclination of said first grinding wheel is slightly greater than the inclination of the first side of the bevel of the blade to be sharpened, while the inclination of the second grinding wheel is substantially parallel to the second side of the bevel, said second grinding wheel being arranged and designed to sharpen the cutting bevel of the blade, while said first grinding wheel is arranged and designed to apply a reaction force to said blade to prevent or reduce flexure of the blade

in the sharpening area and eliminating any burrs produced by the second grinding wheel from the cutting edge.

The first grinding wheel is arranged and designed only to deburr the cutting edge, while preserving a possible surface hardening treatment on this side of the bevel of the blade, and while still supporting the blade to prevent flexure caused by the pressure exerted by the second grinding wheel. The problem mentioned on p. 2, l. 27 - 32 of the international application, ie efficient blade sharpening, decreasing wear of the blade and avoiding the need for substantial excursions of the sharpening grinding wheels to compensate for wear of the blade resulting from frequent sharpening operations, is thus solved.

Document D1 describes a sharpening unit having two grinding wheels arranged on opposite sides of the bevel of the blade. One of the wheels is arranged offset by 3° ("canted") in a plane different from that of the inclination according to the bevel (7°) and is silent as to the relative grain size of the wheels.

Consequently, the subject-matter of claims 1, 9 and 24 is considered as involving an inventive step (Article 33(3) PCT).

- (iv) Claims 2 to 8, 10 to 23 and 25 to 34 are dependent on claims 1, 9 and 24, respectively, and as such also meet the requirements of the PCT with respect to novelty and inventive step.

II. Claims 35 to 48

- (i) As these claims define a physical entity, the features which concern the state of the blade in relation to the sharpening process, for example claim 35 "... before sharpening ...", render these claims unclear, contrary to Art. 6 PCT.
- (ii) The additional features of dependent claims 39 to 41 attempt to extend the scope of claim 35 from NITREG treated blades to other hardening treated blades, which renders claim 35 unclear, contrary to Art. 6 PCT.
- (iii) The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 35 does not involve an inventive step in the sense of Article 33(3) PCT.

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Starting from either document D2 or D4, the specific hardening treatment and thickness range are found common in the art, and could not therefore justify an inventive step, see, for example, document D5, claim 6, figure 2, diffusion depth 30 to 100 micrometers, hardness around 70 HRC, or the documents referred to on page 3, lines 27 to 33 of the international application.

- (iv) Dependent claims 36 to 48 do not appear to contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step.

Claims

1. A sharpening unit to sharpen a disk-shaped cutting blade (19) with a bevel (205) with a continuous circular cutting edge (203), comprising a first grinding wheel (81) and a second grinding wheel (83) acting on a first side (207) and on a second side (209) of said bevel (205), characterized in that: said first grinding wheel (81) has a finer grain than said second grinding wheel (83); the inclination of said first grinding wheel is such that when the unit is in operation, said first grinding wheel is placed against the first side (207) of the blade with a slightly greater inclination than the inclination of the first side, in respect of a lying plane (PG) of the cutting edge of the blade, while the inclination of said second grinding wheel (83) is substantially parallel to the second side (209) of said bevel, and said second grinding wheel is arranged and designed to sharpen the cutting bevel of the blade, while said first grinding wheel is arranged and designed to apply a reaction force to said blade to prevent or reduce flexure of the blade in the sharpening area and eliminating any burrs produced by the second grinding wheel from the cutting edge.

2. Sharpening unit as claimed in claim 1, characterized in that said first and said second grinding wheel are provided with a movement to move towards and away from the blade according to a direction essentially parallel to their axes of rotation.

3. Sharpening unit as claimed in claim 2, characterized in that the movement to move said first and said second grinding wheel towards the blade is controlled so that the first grinding wheel comes into contact with the first side of the blade before the second grinding wheel comes into contact with the second side of the blade, and moves out of contact with said first side of the blade after the second grinding wheel has moved out of contact with the second side of the blade.

4. Sharpening unit as claimed in claim 3, characterized in that the movement to move the grinding wheels towards and away from the blade is controlled so that the first grinding wheel moves out of contact with the first side of the blade after said blade has made at least one turn around its axis subsequent to the second grinding wheel moving away from the second side.

5. Sharpening unit as claimed in one or more of the claims from 1 to 4, characterized in that said first and said second grinding wheel are motorized.

6. Sharpening unit as claimed in one or more of the claims from 1 to 5, characterized in that the inclinations of said first and said second grinding wheel are

equal and opposite in respect of a lying plane of the cutting edge of the blade, said lying plain being essentially orthogonal to the axis of rotation of the blade.

7. Sharpening unit as claimed in one or more of the claims from 1 to 6, characterized in that said first grinding wheel has an extremely fine grain, from 7 to 46 according to ISO standards, and preferably around 7.

8. Sharpening unit as claimed in one or more of the claims from 1 to 7, characterized in that said second grinding wheel has a fine grain, between 45 and 91 according to ISO standards and preferably between 70 and 80.

9. A cutting machine to cut rolls of wound web material, comprising:

10 • at least a disk-shaped blade (19) rotating around an axis of rotation (B-B) and having a cutting bevel (205), with a continuous cutting edge (203), defined by a first side (207) and by a second side (209), the first side having a greater radial extension than the second side, and at least said first side having a surface hardening treatment;

15 • at least a sharpening unit (80) for said blade, with at least a first grinding wheel (81) acting on said first side (207) and a second grinding wheel (83) acting on, the second side (209);

characterized in that: said sharpening unit is produced according to one or more of the claims from 1 to 8.

20 10. Cutting machine as claimed in claim 9, characterized in that the inclination of the first grinding wheel (81) in respect of the first side (207) of the bevel and the thickness (T) of said hardening treatment allow the cutting edge (203) of the blade to remain within the thickness that has been subjected to hardening treatment.

25 11. Cutting machine as claimed in claim 9 or 10, characterized in that said first and said second grinding wheel are equipped with a movement to move them towards and away from the blade according to a direction essentially parallel to their respective axis of rotation, said movement also recovering wear on the blade caused by successive sharpenings.

30 12. Cutting machine as claimed in one or more of the claims from 9 to 11, characterized in that the inclinations of said first and said second grinding wheel are equal and opposed in respect of a lying plane (PG) of the cutting edge (203) of the blade (19), said plane being essentially orthogonal to the axis of rotation (B-B) of the blade, and in that the inclinations of said two sides (207, 209) of the bevel (205) of the blade are different in respect of the lying plane (PG) of the cutting edge of the

blade, the first side (207) having, in respect of said lying plane, a lesser inclination than the second side (209).

13. Cutting machine as claimed in one or more of claims 9 to 12, characterized in that said first side (207) is substantially parallel to the lying plane (PG) of the cutting edge of the blade.

14. Cutting machine as claimed in claim 12, characterized in that the difference in inclination between said first and said second side is at least 1° and preferably between around 1.5° and around 2.5° .

15. Cutting machine as claimed in one or more of the claims from 10 to 14, characterized in that the thickness of said hardening treatment of said first side is equal to or greater than 30 micrometers and preferably equal to or greater than 80 micrometers and even more preferably equal to or greater than 90 micrometers, and even more preferably equal to or greater than 100 micrometers.

16. Cutting machine as claimed in one or more of the claims from 9 to 15, characterized in that at least said first side of the blade has a surface hardness greater than 70 HRC and preferably equal to or greater than around 72 HRC.

17. Cutting machine as claimed in one or more of the claims from 9 to 15, characterized in that said blade is made of alloy steel.

18. Cutting machine as claimed in one or more of claims 9 to 17, characterized in that at least said first side has a surface treatment obtained by penetration of molecules or atoms within the structure of the base material forming the blade.

19. Cutting machine as claimed in claim 18, wherein said surface treatment is a controlled nitriding treatment.

20. Cutting machine as claimed in one or more of claims 9 to 17, characterized in that at least said first side has a surface treatment consisting in a deposit of a material which is harder than the base material forming the blade.

21. Cutting machine as claimed in at least claim 17, characterized in that said blade is made of chrome steel containing molybdenum.

22. Cutting machine as claimed in one or more of the claims from 9 to 21, characterized in that the inclination of said first side is equal to or less than 9° and preferably equal to around 8° in respect of said lying plane (PG).

23. Cutting machine as claimed in one or more of the claims from 9 to 22, characterized in that said blade (19) has a body delimited by two planes (201A, 201B) essentially parallel to each other and essentially orthogonal to the axis of rota-

tion (B-B) of the blade.

24. Method for sharpening a disk-shaped blade (19), to cut rolls of web material, rotating around an axis of rotation (B-B), said blade having a cutting bevel (205), with a continuous cutting edge (203), defined by a first side (207) and by a
- 5 second side (209), the first side having a greater extension in a radial direction than the second side, and at least said first side having a surface hardening treatment; wherein a first grinding wheel (82) acts on said first side and a second grinding wheel (83) acts on said second side,

characterized in that:

- 10 - said first grinding wheel (81) has a finer grain than said second grinding wheel (83);
- said first grinding wheel (81) is placed against the first side (207) of the blade with a slightly greater inclination than the inclination of the first side, in respect of a lying plane (PG) of the cutting edge of the blade;
- 15 - said second grinding wheel (83) is placed against the second side of the blade with an inclination essentially corresponding to the inclination of said second side in respect of said lying plane;
- wherein said second grinding wheel sharpens the cutting bevel, while said first grinding wheel applies a reaction force to said blade to prevent or reduce flexure
- 20 of the blade in the sharpening area and eliminates any burrs produced by the second grinding wheel from the cutting edge.

25. Method as claimed in claims 24, characterized by using a blade whose surface hardening treatment has a thickness of at least 30 micrometers and preferably equal to or greater than 80 micrometers and even more preferably equal to or greater
- 25 than 90 micrometers and even more preferably equal to or greater than 100 micrometers.

26. Method as claimed in claims 24 or 25, characterized in that the inclination of the first grinding wheel (81) in respect of the first side (207) of the bevel and the thickness of said hardening treatment are such that the cutting edge (203) of
- 30 the blade (19) remains within the thickness interested by the hardening treatment.

27. Method as claimed in one or more of the claims from 24 to 26, characterized in that said first and said second grinding wheel are motorized.

28. Method as claimed in one or more of the claims from 24 to 27, characterized in that said first and said second grinding wheel are moved against said

blade with a movement essentially parallel to the respective axis of rotation, said movement also recovering wear of the blade caused by successive sharpenings.

29. Method as claimed in claim 28, characterized in that the first grinding wheel comes into contact with the first side of the blade before the second grinding wheel comes into contact with the second side (209) of the blade; and in that the first grinding wheel moves out of contact with said first side of the blade after the second grinding wheel has moved out of contact with the second side of the blade

30. Method as claimed in claim 29, characterized in that the movement to move the grinding wheels towards and away from the blade is controlled so that the first grinding wheel moves out of contact with the first side of the blade after said blade has made at least one turn about its axis subsequent to the second grinding wheel moving away from the second side.

31. Method as claimed in one or more of the claims from 24 to 30, characterized in that the inclinations of said first and said second grinding wheel (83) are equal and opposed in respect of a lying plane of the cutting edge (203) of the blade (19), essentially orthogonal to the axis of rotation (B-B) of the blade, and in that the inclinations of said two sides (207, 209) of the bevel (205) of the blade in respect of the lying plane (PG) of the cutting edge of the blade are different, the first side being less inclined in respect of said lying plane than the second side, and in that said grinding wheels produce a symmetrical cutting edge in respect of the lying plane of the said cutting edge.

32. Method as claimed in claim 31, characterized in that the difference in inclination between said first and said second side is at least 1° and preferably between around 1.5° and around 2.5°.

33. Method as claimed in one or more of the claims from 24 to 32, characterized in that it uses a first grinding wheel with an extremely fine grain, from 7 to 46 according to ISO standards, and preferably around 7.

34. Method as claimed in one or more of the claims from 24 to 33, characterized in that it uses a second grinding wheel with a fine grain, from 45 to 91 according to ISO standards and preferably from 70 to 80.

35. A disk-shaped blade to cut rolls of wound web material, comprising an axis of rotation (B-B), a body with flat parallel faces (201A, 201B) and a cutting bevel (205), with a continuous cutting edge (203), defined by a first side (207) and by a second side (209), the first side having, before sharpening, a greater extension in

a radial direction, and at least said first side having a surface hardening treatment; characterized in that said surface treatment is a NITREG® treatment and has a thickness of at least 30 micrometers and preferably of at least 80 micrometers and more preferably approximately equal to or greater than 90 micrometers and even more preferably equal to at least around 100 micrometers.

36. Disk-shaped blade as claimed in claim 37, characterized in that at least said first side has a surface hardness of over 70 HRC and preferably equal to or greater than around 72 HRC.

37. Disk-shaped blade as claimed in claim 36 or 37, characterized in that said blade is made of alloy steel.

38. Disk-shaped blade as claimed in claim 39, characterized in that it is produced in molybdenum chrome steel.

39. Disk-shaped blade as claimed in one or more of claims 36 to 39, characterized in that at least said first side has surface thermal treatment by means of penetration of atoms or molecules within the structure of the base material forming the blade.

40. Disk-shaped blade as claimed in claim 40, characterized in that the surface treatment is a controlled nitriding treatment.

41. Disk-shaped blade as claimed in one or more of claims 36 to 39, characterized in that said surface treatment consists in a deposit of a material having a higher hardness than the hardness of the base material forming the blade.

42. Disk-shaped blade as claimed in one or more of the claims from 36 to 42, characterized in that said first side has, in respect of a lying plane (PG) of the cutting edge, a lesser inclination than the other side.

43. Disk-shaped blade as claimed in claim 43, characterized in that the first side is substantially parallel to the lying plane (PG) of the cutting edge of said blade.

44. Disk-shaped blade as claimed in claim 43 or 44, characterized in that the difference in inclination between said first and said second side is of at least 1° and preferably between around 1.5° and around 2°.

45. Disk-shaped blade as claimed in claim 43 or 45, characterized in that said first side has an inclination equal to or less than around 9° and preferably equal to around 8° in respect of said lying plane (PG).

46. Disk shaped blade as claimed in one or more of the claims from 36 to

46, characterized in that before sharpening said cutting edge (203) lies on a lying line (PG) that does not coincide with the plane of the center line (PM) of the blade and in respect of it is moved towards the first side (207).

5 47. Disk-shaped blade as claimed in one or more of the claims from 36 to 47, characterized in that it has a body delimited by two planes (201A, 201B) essentially parallel to each other and essentially orthogonal to the axis of rotation (B-B) of the blade.

10 48. Disk-shaped blade as claimed in one or more of the preceding claims, characterized in that the thickness of said treatment is such that the cutting edge of the blade, once sharpened by two grinding wheels contacting the sides of the cutting bevel, remains within the thickness of said treatment.

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